Have you ever experienced a "water failure"? That is, have you ever turned on your faucet and found that no water came out of it? If you get your water from a municipal water system, the answer is probably "no."

We have power failures all the time. Cable TV goes out fairly frequently. Although less common, the phone system goes down every so often, and it is now common to get an "all circuits busy" message when making long-distance calls. But the water in any city or suburb is always there. Water pressure is very reliable.

A big reason for that level of reliability is the **water tower.** You see water towers everywhere, especially if you live in a flat area full of small towns. Each water system has one or more towers. Here is an explanation of how water towers work.

Tower, Tank and Pump

A water tower is an incredibly simple device. Although water towers come in all shapes and sizes, they all do the same thing: A water tower is simply a large, elevated tank of water. For example, take the water tower located at 3555 E. Pabst Ave.

Water towers are tall to provide **pressure**. Each foot of height provides 0.43 PSI (pounds per square Inch) of pressure. A typical municipal water supply runs at between 50 and 100 PSI (major appliances require at least 20 to 30 PSI). The water tower must be tall enough to supply that level of pressure to all of the houses and businesses in the area of the tower. So water towers are typically located on **high ground**, and they are tall enough to provide the necessary pressure. In hilly regions, a tower can sometimes be replaced by a simple tank located on the highest hill in the area.

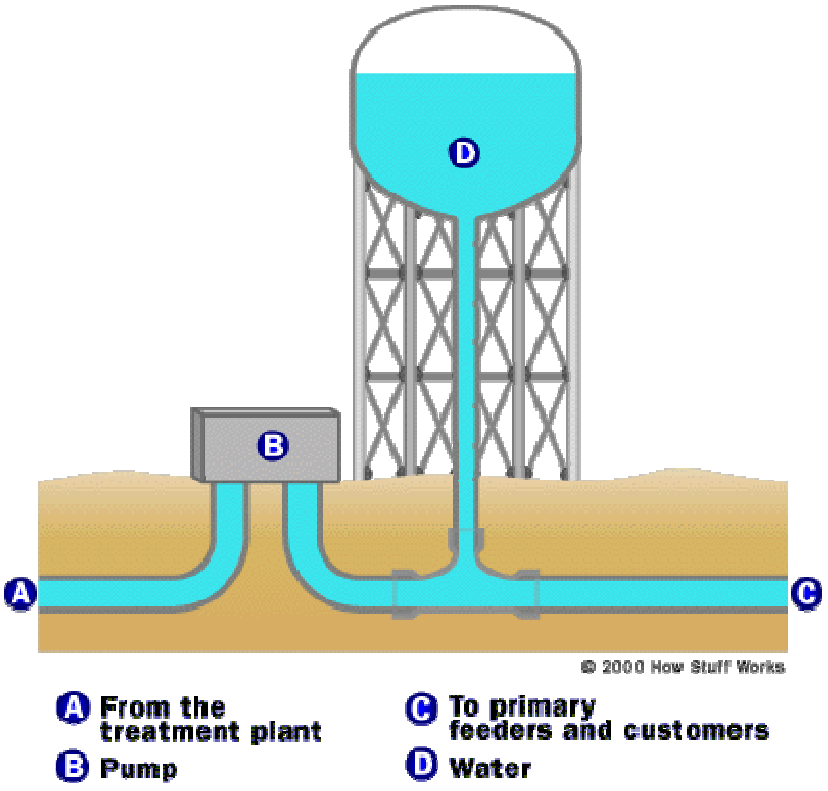
A water tower's **tank** is normally quite large. A normal in-ground swimming pool in someone's backyard might hold something like 20,000 or 30,000 gallons (that's a lot of water!), and a typical water tower might hold 50 times that amount! Typically, a water tower's tank is sized to hold about a day's worth of water for the community served by the tower. If the pumps fail (for example, during a power failure), the water tower holds enough water to keep things flowing for about a day. The water tower in Cudahy holds 500,000 gallons of water.

One of the big advantages of a water tower is that it lets a municipality size its pumps for *average* rather than *peak* demand. That can save a community a lot of money.

Say that the **water consumption** for a pumping station averages 500 gallons of water per minute (or 720,000 gallons over the course of a day). There will be times during the day when water consumption is much greater than 500 gallons per minute. For example, in the morning, lots of people wake up at about the same time (say 7:00 a.m.) to go to work. They go to the bathroom, take a shower, brush their teeth, etc. Water demand might peak at 2,000 gallons per minute at 7

a.m. -- there is a big cost difference between a 500-gallon-per-minute pump and a 2,000-gallon-per-minute pump. Because of the water tower, the municipality can purchase a 500-gallon-per-minute pump and let the water tower handle the peak demand. At night, when demand normally falls to practically zero, the pump can make up the difference and refill the water tower.

In Cudahy the water we drink comes from Lake Michigan. The water is treated in the **water treatment plant** to remove sediment (by filtration and/or settling) and bacteria (with ultraviolet light and chlorine). The output from the water treatment plant is clear, germ-free water. A high-lift pump pressurizes the water and sends it to the water system's primary **feeder pipes**. The water tower is attached to the primary feeders quite simply, as shown in this diagram:



If the pump is producing more water than the water system needs, the **excess** flows automatically into the tank. If the community is demanding more water than the pump can supply, then water flows out of the tank to meet the need.

WHY DON'T WATER TOWERS FREEZE IN THE WINTER?

They do freeze; they just don't freeze solid. Water levels in water towers fluctuate throughout the day. Ice forms on the surface of the water and floats on top of the water as the water level rises and falls.